

WHAT IS CLAIMED IS:

1. A sensor unit mounted on a mobile unit, comprising:
an antenna section including at least an antenna element
5 for receiving a high-frequency signal from an external positioning
system;

a sensor section including at least a gyro sensor for
detecting an angular velocity of the mobile unit and an acceleration
sensor for detecting an acceleration of the mobile unit;

10 a combining circuit including at least a first signal
line through which the high-frequency signal output from the
antenna section is sent, a second signal line through which a signal
output from the sensor section is sent, and a node, which is a
connecting point of the first signal line and the second signal
15 line; and

a casing for accommodating the antenna section, the
sensor section, and the combining circuit.

2. The sensor unit according to claim 1, wherein
20 at the node, the sensor unit combines at least the
high-frequency signal output from the antenna section and the
signal output from the sensor section, and generates a composite
signal.

25 3. The sensor unit according to claim 1, wherein

the sensor section further includes:

an A/D converter for converting at least the angular velocity detected by the gyro sensor and the acceleration detected by the acceleration sensor to digital angular velocity data and digital acceleration data, respectively;

a processor for generating a data unit including at least the angular velocity data and the acceleration data obtained through conversion by the A/D converter; and

a digital modulator for digitally modulating an input carrier with the data unit generated by the processor and generating a digital modulated signal, and

at the node, the sensor unit combines at least the high-frequency signal output from the antenna section and the digital modulated signal generated by the digital modulator, and generates a composite signal.

4. The sensor unit according to claim 3, wherein a frequency of the carrier is lower than a lower limit of an occupied frequency bandwidth of the high-frequency signal.

5. The sensor unit according to claim 4, wherein the high-frequency signal is sent from the GPS (Global Positioning System) as the positioning system, and has a center frequency of 1.575 GHz, and

the digital modulated signal is generated by digitally

modulating an amplitude of a carrier having a frequency of 500 kHz with the data unit.

5 6. The sensor unit according to claim 3, wherein
the sensor section further includes:

a barometric pressure sensor for detecting a barometric pressure in the vicinity of the mobile unit; and

a temperature sensor for detecting a temperature in the vicinity of the temperature sensor, and

10 the A/D converter further converts the barometric pressure detected by the barometric pressure sensor and the temperature detected by the temperature sensor to digital barometric pressure data and digital temperature data, respectively, and

15 the data unit generated by the processor further includes the barometric pressure data and the temperature data converted by the A/D converter.

20 7. The sensor unit according to claim 3, wherein
the combining circuit further includes:

a high-pass filter, placed between the antenna section and the first signal line, for passing a signal having a frequency equal to or higher than a lower limit of a frequency bandwidth occupied by the high-frequency signal;

25 a band-pass filter, connected to the digital

modulator, for passing a signal having a frequency bandwidth occupied by the digital modulated signal; and

a band elimination filter, placed between the second signal line and the band-pass filter, for passing a signal having
5 a frequency outside the frequency bandwidth occupied by the high-frequency signal.

8. The sensor unit according to claim 1, further comprising:

10 a substrate having placed thereon at least the sensor section and the combining circuit and being accommodated in the casing; and

an accommodation box accommodating an entirety or part of the sensor section and/or the combining circuit, having an upper
15 surface tilted with respect to a bottom surface of the casing, and being formed on the substrate, wherein

at least the antenna element is placed on the upper surface of the accommodation box.

20 9. A locating unit connected to a sensor unit and mounted on a mobile unit, wherein

the sensor unit sends a composite signal obtained by combining a high-frequency signal transmitted from an external positioning system and a digital modulated signal obtained by
25 modulating a carrier with a data unit including at least angular

velocity data indicative of an angular velocity of the mobile unit in a digital format and acceleration data indicative of an acceleration of the mobile unit in a digital format,

the locating unit comprising:

5 a dividing circuit for dividing, in response to reception of the composite signal sent from the sensor unit, the received composite signal into the high-frequency signal and the digital modulated signal;

 a receiver for performing, in response to reception
10 of the high-frequency signal obtained through division by the dividing circuit, a predetermined process on the received high-frequency signal and calculating a current position of the mobile unit;

 a digital demodulator for demodulating the digital
15 modulated signal obtained through division by the dividing circuit and reproducing the data unit; and

 a processor for deriving an azimuth angle and a travel distance of the mobile unit from the angular velocity data and the acceleration data included in the data unit reproduced by the
20 digital demodulator and calculating a current position of the mobile unit by using the derived azimuth angle and travel distance.

10. The locating unit according to claim 9, wherein
the data unit further includes barometric pressure data
25 indicative of a barometric pressure in the mobile unit in a digital

format and temperature data indicative of a temperature in the mobile unit in a digital format, respectively, and

the processor

derives a change in altitude of the mobile unit based
5 on the barometric pressure data included in the data unit reproduced
by the digital demodulator, and calculates the current position
of the mobile unit by further using the derived change in altitude,
and

derives the temperature in the mobile unit from the
10 temperature data included in the data unit reproduced by the digital
demodulator.

11. The locating unit according to claim 10, wherein
the processor further corrects the derived azimuth angle,
15 travel distance, and change in altitude by using the derived
temperature.